

radiotherapy compared to smokers who quit, however, the findings were statistically insignificant. Further exploration will seek to elucidate any local effect of smoking as well as to identify socioeconomic predictors of being a continuous smoker during treatment.

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Poster: RTT track: Education and training

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PO-1130

Development and implementation of a treatment planning teaching module utilising an immersive 3D simulation system

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**Purpose/Objective:** During training, radiation therapists must acquire a comprehensive range of theoretical and practical competencies to meet the demands of safe clinical practice. It is essential that students understand the conceptual basis of radiation therapy (RT) treatment planning and can translate this understanding to the clinical environment. Implementation of three-dimensional virtual environment systems in RT training programmes has become increasingly prevalent in recent years. The Virtual Environment for Radiation Therapy Training (VERT) system simulates an RT treatment room, allows operation of a virtual linear accelerator, and can demonstrate imported patient scans and treatment plans. Although VERT has been shown to improve student psychomotor skills in operating a linear accelerator, its value in facilitating understanding of RT treatment planning concepts has not been previously reported.

**Materials and Methods:** A VERT-based teaching module was developed that compares the clinical, technical and dosimetric aspects of treatment plans of three commonly used RT treatment techniques (3DCRT, IMRT, and VMAT) for a prostate case study patient. The effectiveness of the module in teaching RT planning concepts was evaluated in a cohort of first-year RT students. A mixed methods crossover study design was used to compare the VERT module with the pre-existing 'standard' treatment planning teaching module. Students' perceived understanding of treatment techniques and attitudes towards the VERT module were assessed by questionnaires at several time points during the study. A semi-structured interview was conducted with teaching staff to explore their experiences in implementing the VERT module and their perceptions of students' responses.

**Results:** Analysis of the results showed that both the VERT module and the standard module improved students' perceived understanding of treatment planning techniques to a similar extent. Following crossover of the student groups, a strong cumulative value was shown from the combined use of both modules. The most beneficial sequence of modules was seen to vary depending on the aspect of treatment planning assessed. However, both students and lecturers reported a preference for the standard module being taught first to establish a theoretical framework, and the VERT module second to bridge this framework to the clinical environment. Participants found the 3D effect of VERT valuable and could

relate the simulated treatment techniques to their limited experiences in the clinical environment. Lecturers described the VERT module as a form of educational tool they had sought, but until now not been able to generate themselves. Students and lecturers both expressed strong support for the continued use of VERT-based teaching methods.

**Conclusions:** Together, these data support the continued implementation and investigation of VERT as a teaching tool to facilitate learning of RT planning concepts. The ability to model plan-specific, technical and dosimetric data within a virtual treatment environment presents a range of opportunities to enhance RT students' education. Future research includes the continued development of VERT modules to address more complex concepts of RT planning and treatment delivery.

PO-1131

Learning to manage emotion in the radiotherapy setting: the role of service users in education

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**Purpose/Objective:** The aim of this study was to explore the ways in which radiotherapy and oncology students learned from the experiences of patients and carers. The key objectives were to better understand how involvement activities with service users in the classroom influenced students' development and informs curriculum enhancements.

**Materials and Methods:** A phenomenographical approach using in-depth interviews was utilised to explore students' learning. Following curriculum activities with service users, students were invited to participate in the study. Eighteen students consented to take part and each interview was audio recorded and analysed utilising Attride-Stirling's thematic network analysis (TNA) framework. This framework allowed interpretation at individual and collective levels. As an educator and researcher, bias was reduced by using a degree of bracketing of my own assumptions, member checking during the coding and categorising stage and engaging in reflexive practice throughout the process. Thus the results reflect the students' conceptualisation of learning not my own.

**Results:** Three global themes were identified: emotional recognition, emotional labour and professional presentation. Facilitated interaction in the classroom was a catalyst for reflecting on everyday practice and impacted on the ways in which students communicated with patients on an emotional level. Further learning occurred in the clinical setting evident in their detailed reflections of emotional encounters they had experienced. Three different methods of coping with emotional situations were identified: (1) distancing, (2) engagement and (3) a balance of distancing and compassionate behaviour. The importance of emotional management in practice was recognised as a key professional attribute.

**Conclusions:** The curriculum activities highlighted the emotional impact of cancer on patients and carers, but the data also demonstrates how emotional experiences can affect

students. The study supports service user involvement in education as a mechanism for understanding the human experience and developing patient care strategies. Equally, curriculum enhancements should address emotional management and self-care as part of professional development. The findings demonstrate that such curriculum activities can have a positive impact on students in their preparation for practice as compassionate and resilient professionals.

#### PO-1132

High quality treatment delivery requires high quality online matching

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**Purpose/Objective:** Due to the installation of new radiation equipment (planning system and linacs) the majority of our treatments is now given as volumetric modulated arc therapy (VMAT). With this change of technique, there was a need for a procedure that resulted in an online-matching method that was consistent, time-saving and accurate.

**History:** Using our former linacs, an off-line Shrinking Action Level (SAL) protocol was used to correct patient set. This protocol was based on MegaVoltage Electronic Portal Images (MV-EPI) with an initial action level  $\alpha$  of 6 mm and a maximum number of fractions  $N_{\max}=2$  that  $\alpha$  could decrease. Set-up was determined from a pair of anterior-posterior and lateral set-up field images per fraction and averaged for at maximum the last three imaged fractions without set-up correction.

**Materials and Methods:** With TrueBeam linear accelerators (Varian Medical Systems), Cone beam CT scans (CBCTs) or kV-EPI images (EPIs) are acquired prior to every treatment fraction. Moving from an off-line to online set-up procedure required changes to the existing workflow.

**Results:** First, during the first introduction period, the Radiation Technicians (RTTs) at the linacs could call for assistance from either a medical physicist or a radiation oncologist. To reduce this assistance and to make the procedures more objective, a standard operating procedure (SOP) was developed. The target volumes (GTV, CTV, PTV) and organs at risk (OARs) delineated on the planning CT scan are projected on the treatment images. Both the EPIs and CBCTs are automatically matched, followed by visual checks: in lateral and frontal direction for EPIs, and in sagittal, frontal and transversal directions for CBCTs. Acceptable errors were defined per treatment site, e.g., in head-and-neck only a 2 mm discrepancy is tolerated at the position of the PTV prescribed to the highest dose level, whereas in the elective nodal volume 4 mm is acceptable. Using touch screens on the linear accelerators, RTTs can quickly check the protocol and possible instructions using a traffic light system. Second, we developed an e-learning module explaining the basic principles of treatment planning (Figure 1). It also illustrates the steps required for high-quality matching after acquiring EPIs and CBCTs, and provides case examples. At the end of the module, the RTTs undergo a self-test with further explanation if required. Third, a face-to-face workshop is organized explaining the SOP in detail and discussing difficult cases. At present, we are introducing this

SOP for head-and-neck cancer treatments and soon for other treatment sites.

**Conclusions:** In the era of high-conformal treatment techniques and accurate dose calculations, the demand for high accuracy treatment delivery verification has increased. Dedicated SOPs and e-learning modules facilitating this process result in more consistent, accurate, and time-saving treatment delivery.

#### PO-1133

Outcomes of a high impact simulation rich education for RTTs bridging the gap from diagnostic radiography

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**Purpose/Objective:** We have previously presented a new model for educating RTTs in small and midsize countries without a dedicated bachelors degree in RT. Educational outcomes of the first pilot course for clinically experienced RTTs are reported.

**Materials and Methods:** The course was based on the European Core Curriculum, with the focus on clinical & radiation therapy specific competencies. The syllabus was built to address varying levels of vocational & professional experience and logistical issues (releasing RTTs from clinical work in order to attend the course). The course comprised of 22 meetings (125 hrs) over 5 months of which half were held on the weekend. This provided the further challenge of teaching efficiently. The varying levels of experience was used advantageously in the interactive teaching method adopted. The TPS, VERT & clinical cases were used to teach in a highly relevant way. The methodology encouraged double loop learning. To check the knowledge outcome, a pre & post-course test was performed. Anonymous quantitative feedback (likert scale 1-6, 6 being the highest), with a qualitative section for the 4 main topics - physics, dosimetry, radiobiology & clinical skills was collected after every meeting.

**Results:** Eighteen RTTs participated in the course, with students from all 8 departments in the country.

The vocational experience of the RTTs ranged from 0.5 - 37 years. The mean vocational experience was 8.3 years. The mean score of the pre-course test, based on 17 multiple choice questions (MCQs), was 37% ( $\pm 13$ ). The mean result of the post course exam which included the same 17 MCQ (mean = 98%) ( $p < 0.05$ ) plus more advanced questions was 88% ( $\pm 5$ ).

In response to the question 'To what extent does this topic contribute to your work?' the aggregate data mean was physics - 4.8, dosimetry - 5.1, radiobiology - 4.9 & clinical skills - 5.6. The overall aggregate data mean in answer to the question 'to what extent was the time used efficiently?' was 5.6. The overall assessment of 'how does the course contribute to your work?' was 5.8. In answer to the question 'would you recommend this course to your colleagues?' the